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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/681,765	10/08/2003	Holger Winkelmann	8540G-000161	8289

27572 7590 06/23/2008

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EXAMINER	
ECHELMEYER, ALIX ELIZABETH	
ART UNIT	**PAPER NUMBER**
1795	

MAIL DATE	DELIVERY MODE
06/23/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/681,765	WINKELMANN ET AL.	
	Examiner	Art Unit	
	Alix Elizabeth Echelmeyer	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 March 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,5-11,13-25,29 and 30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,5-11,13-25,29 and 30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response

1. This Office Action is in response to the request for reconsideration filed March 10, 2008. No claims have been amended. Claims 1, 2, 5-11, 13-23, 29 and 30 are pending and are rejected finally for the reasons given below.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 2, 5-9, 11, 13-15, 17-23, 29 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi et al. (US Pre-Grant Publication 2002/0098396) in view of Heung (US Patent 6,015,041), Ovshinsky et al. (US 2001/0033959) and Bruck et al. (US 2003/0129461)

Kobayashi et al. teach a fuel cell system including a hydrogen storage tank, a tank containing a hydrogen-occluding alloy, and a heat exchanging means to transfer the heat generated in the hydrogen-occluding alloy containing tank to the fuel cell (Figure 1, [0018]-[0022]). The tank would inherently be made of a thermally-conductive material, since the purpose of the tank is to transfer heat.

The system also includes means for discharging hydrogen from the hydrogen-occluding alloy ([0025]).

As for claims 19-23, Kobayashi et al. teach that $LaNi_5$ as a hydrogen-occluding alloy ([0064], [0066]).

Regarding claims 17, 18 and 29, Figure 2 of the current application indicates that $LaNi_5$ has an equilibrium pressure for absorption of hydrogen at 25°C at less than 0.5 atm.

Regarding claim 2, Kobayashi et al. teach one tank having one channel for the occlusion of hydrogen, but fail to teach a plurality of flow channels. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a plurality of channels, since more channels would expose a greater surface area of metal to hydrogen, generating more heat for the warm-up of the fuel cell. It has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. MPEP 2144.04 (VI).

As for claim 6, Kobayashi et al. teach the use of water, which is electrically conductive, to transfer heat from the metal hydride tank to the fuel cell. The fluid distribution element of Kobayashi et al. is the water channel, with the heating element being the metal hydride tank.

Regarding claims 1, 29 and 30, Kobayashi et al. do not teach that the hydrogen-occluding alloy is in particle form or the filter.

Heung teaches an apparatus for storing and releasing hydrogen. The hydrogen is stored in a metal hydride that is in ground particle form. The apparatus comprises chambers divided by aluminum foam for containing the particles of metal hydride. A

filter may be provided within the apparatus to allow hydrogen to flow but prevent particles from escaping (abstract).

The filter of Heung would inherently have pores smaller than the diameter of the metal hydride, since the pores would be required to allow hydrogen to flow but could not be larger than the diameter of the metal hydride since that would allow the particle to escape, rendering the filter ineffective.

It would be desirable to use fine particles of a hydrogen occluding metal as taught by Heung since the smaller particle size would expose a larger surface area of the material to hydrogen, generating more heat.

It would be advantageous to provide a filter to prevent the escape of metal hydride particles since, if the particles escaped, stored hydrogen would be lost to the system and the hydrogen flow path could become contaminated or blocked.

Regarding claims 11 and 13-15, the aluminum foam of Heung is used because it improves heat transfer and holds the solid hydrogen storage medium in separate cells (column 2 lines 10-11).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use fine particles of a hydrogen occluding metal since the smaller particle size would expose a larger surface area of the material to hydrogen, generating more heat. Further, it would have been obvious to provide a filter to prevent the escape of escape of metal hydride particles since, if the particles escaped, stored hydrogen would be lost to the system and the hydrogen flow path could become contaminated or blocked. Additionally, it would have been obvious to provide a

body of aluminum foam since it improves heat transfer and holds the solid hydrogen storage medium in separate cells.

With further regard to claims 1 and 29, Kobayashi et al. in view of Heung fail to teach that the metal hydride storage tank, analogous to the heating element of the instant invention, is contained within the fuel cell stack, and that the heating element is in contact with at least one component of the fuel cell stack.

Ovshinsky et al. ('959) teach a metal hydride unit adjacent the anode of a fuel cell ([0070], Figure 2). It is noted that the heat from the hydrogen generation within the metal hydride storage unit heats the fuel cell ([0090]).

It would be desirable to put the metal hydride tank of Kobayashi et al. in view of Heung adjacent the fuel cell as taught by Ovshinsky et al. ('959) in order to use the heat generated to heat the fuel cell through direct contact, which would prevent heat loss that would occur when the heat was transported from the tank to the fuel cell as in Kobayashi et al. in view of Heung.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to put the metal hydride tank of Kobayashi et al. in view of Heung adjacent the fuel cell as taught by Ovshinsky et al. ('959) in order to use the heat generated to heat the fuel cell through direct contact, which would prevent heat loss that would occur when the heat was transported from the tank to the fuel cell as in Kobayashi et al. in view of Heung.

Kobayashi et al. in view of Heung and Ovshinsky et al. (‘959) fail to teach that the tank is integrated within a fuel cell stack.

Bruck et al. teach a heating element incorporated into a fuel cell (abstract).

The heating element is used to make cold starting of the fuel cell faster ([0047]).

It would be desirable to incorporate the heating element of Kobayashi et al. in view of Heung into the fuel cell stack, such as taught by Bruck et al., since it would make cold starting of the fuel cell faster. The heating element of Kobayashi et al. in view of Heung and Ovshinsky et al. ('959) could be incorporated into the stack, since the only elements separating the heating element from the fuel cell stack are a valve and a conduit (Figure 5). If the conduits connecting the heating element and fuel cell stack were shortened to the point that the heating element was incorporated within the fuel cell stack, then cold start of the stack would be expedited.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the heating element of Kobayashi et al. in view of Heung and Ovshinsky et al. ('959) into the fuel cell stack, such as taught by Bruck et al., since it would make cold starting of the fuel cell faster.

4. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi et al. in view of Heung, Ovshinsky et al. (‘959) and Bruck et al. as applied to claim 1 above, and further in view of Ovshinsky et al. (US 2004/0161652).

The teachings of Kobayashi et al., Heung, Ovshinsky et al. (‘959) and Bruck et al. as discussed above are incorporated herein.

Kobayashi et al. in view of Heung, Ovshinsky et al. ('959) and Bruck et al. fail to teach the metal hydride tank functioning as a heating element surrounding at least a portion of the fuel cell stack.

Ovshinsky et al. ('652) teach a fuel cell pack having a metal hydride tank (**20**) attached on the top of the fuel cell stack ([0024], Figure 2). It is further taught that this location is advantageous because the heat from the fuel cell stack aids in the desorption of hydrogen from the tank.

It would be desirable to place the metal hydride tank of Kobayashi et al. in view of Heung, Ovshinsky et al. ('959) and Bruck et al. on the top of the stack such as taught by Ovshinsky et al. ('652) since that location is advantageous because the heat from the fuel cell stack aids in the desorption of hydrogen from the tank.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to place the metal hydride tank of Kobayashi et al. in view of Heung, Ovshinsky et al. ('959) and Bruck et al. on the top of the stack such as taught by Ovshinsky et al. ('652) since that location is advantageous because the heat from the fuel cell stack aids in the desorption of hydrogen from the tank.

5. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi et al. in view of Heung, Ovshinsky et al. ('959) and Bruck et al. as applied to claim 15 above, and further in view of Shreir et al. (Corrosion (3rd Edition)).

The teachings of Kobayashi et al., Heung, Ovshinsky et al. ('959) and Bruck et al. as discussed above are incorporated herein.

Kobayashi et al. in view of Heung, Ovshinsky et al. ('959) and Bruck et al. fail to teach or render obvious the use of $AlMg_3$ as the storage container of the hydrogen absorbing material.

Shreir et al. teach that $AlMg_3$ is an alloy having very good resistance to atmospheric attack and provides very good protective anodizing.

It would be desirable to use $AlMg_3$ in the tank of Kobayashi et al. in view of Heung, Ovshinsky et al. ('959) and Bruck et al. since it would fare well in the harsh conditions of the fuel cell system, as indicated by the properties taught by Shreir et al.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use $AlMg_3$ in the tank of Kobayashi et al. in view of Heung, Ovshinsky et al. ('959) and Bruck et al. since it would fare well in the harsh conditions of the fuel cell system, as indicated by the properties taught by Shreir et al.

Response to Arguments

6. Applicant's arguments filed March 10, 2008 have been fully considered but they are not persuasive.

Beginning on page 9, Applicant discusses the instant disclosure, stating that in the instant specification, "the integrated and renewable heating element provides self-regulated heating for a fuel cell stack corresponding to the fuel cell system operation, without the need for additional control systems ..." While such a system may be

described in the specification, it is not found in the claims. Specifically, the claims do not require self-regulated heating without the need for additional control systems.

Next, Applicant discusses Kobayashi et al. and Heung, stating at the bottom of page 9 that these references "teach away from the claimed invention because they teach using an insulation layer or heat transfer jacket …" The examiner disagrees with Applicant's characterization of Kobayashi et al., the base reference in the rejection. Kobayashi et al., at the paragraphs Applicant has cited ([0023] and [0089]) teach heat transfer of the heat generated by hydrogen production to the fuel cell using water ([0089]).

At the top of page 10, Applicant again asserts that the instant invention has an integrated heating element that "eliminates additional processing and control systems and enhances heat transfer efficiency …" While the instant fuel cell system may accomplish these, the system as claimed requires only the heat transfer relationship, which is taught by Kobayashi et al.

As for Ovshinsky et al. ('959), the use of metal hydride within a compound anode to store hydrogen, which is then provided to the fuel cell, would easily be recognizable to one having ordinary skill in the art to be useful to teach contacting of the metal hydride unit of Kobayashi et al. in view of Heung with the anode of the fuel cell, since hydrogen would be more readily accessible to the electrode when the two components are physically closer.

Next, Applicant discusses Bruck et al. and the teaching of a heating element incorporated into a fuel cell. Applicant alleges that the heating element of Bruck et al.

can be a positive temperature coefficient material (PTC) integrated into the fuel cell for heating. Applicant alleges that, since Bruck et al. do not specifically teach the use of "self-regulating heating elements that employ a hydrogen storage material that reversibly stores hydrogen" the combination tank of Kobayashi et al. in view of Heung and Ovshinsky et al. ('959) into a fuel cell stack is not valid. The examiner disagrees, holding the position that one having ordinary skill in the art, knowing as discussed above that the metal hydride tank if Kobayashi et al. can be used to heat a fuel cell stack, would look to the teaching of Bruck et al. to put a heater into a fuel cell stack and find that putting the tank of Kobayashi et al. with its heating properties into a fuel cell stack would be obvious since such a combination would provide heat to the stack when needed, for example, during cold start.

Finally, Applicant argues that the hydrogen storage container of Ovshinsky et al. ('652) teaches irreversibly storing hydrogen. While this is true, Kobayashi et al. teach reversibly storing hydrogen. One having ordinary skill in the art would certainly be capable of looking to the teachings of Ovshinsky et al. ('652) and recognizing the value of having a heating element surrounding the stack without being so close minded to think that, in order to use that teaching the teaching of irreversibly storing hydrogen would also have to be utilized in order to benefit from using a heating element surrounding the stack.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alix Elizabeth Echelmeyer whose telephone number is (571)272-1101. The examiner can normally be reached on Mon-Fri 8-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Susy N. Tsang-Foster can be reached on 571-272-1293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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